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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : G01N 21/03, B01L 3/14 — A1

(11) International Publication Number: **WO 97/43622**

(43) International Publication Date: 20 November 1997 (20.11.97)

(21) International Application Number: PCT/IT97/00111

(22) International Filing Date: 13 May 1997 (13.05.97)

(30) Priority Data:
FI96A000114 16 May 1996 (16.05.96) IT

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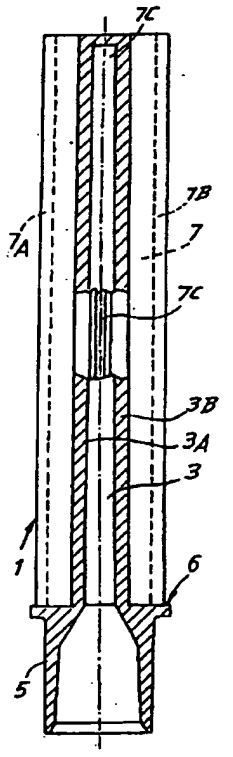
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: A TEST TUBE FOR BIOLOGICAL ANALYSES OF ORGANIC LIQUIDS USING ELECTRO-OPTICAL EQUIPMENT

(57) Abstract

The test tube comprises a container body (1) with a cavity (3) which is essentially prismatic and has an essentially rectangular cross section, a cylindrical connecting part (5) for filling, and a flat laminar zone (7) developed as an extension of one of the walls of the said cavity. Information which can be read optically, such as bar codes or the like, may be accommodated on this flat laminar zone (7).



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A test tube for biological analyses of organic liquids using electro-optical equipment

Description

Technical Field

The invention relates to a test tube for biological analyses of organic liquids using electro-optical equipment in general, such as photometers, for example, used for sedimentation velocity (ESR) analyses and the like.

Background Art

Single-use test tubes are known which are made of synthetic resin and have a tubular structure, as are other types which have a substantially prismatic cavity with a rectangular cross-section, the two larger walls of which are passed through by the rays which allow the electro-optical analysis. All these test tubes do not offer available surfaces for adopting the so-called bar codes used to read data relating to the tests and to the person whose liquids are being analysed; the use of labels and/or symbols and manually written information is not pratical, is likely to give rise to errors and requires a considerable amount of time.

Objects and Disclosure of the Invention

The object of the invention is to overcome the aforementioned drawbacks and provides other objects and advantages which will become obvious from a reading of the text which follows.

Basically, the test tube in question - having a container body with a liquid-containing cavity defined by walls comprising zones located opposite one another and capable of being passed through by the rays of an optical analysing system, and a connecting part for filling and closing - according to the invention is characterized in that it comprises moreover at least one surface, which is developed so as not to interfere with said zones located

opposite one another and on which surface information which can be optically read, such as bar codes or the like, may be accommodated.

Said surface or surfaces and said container body may have, in cross-section, a form contained in a circular volume so as to be suitable for use with equipment having seats with a circular section.

According to an embodiment, the test tube may have a container body with a cavity which is substantially prismatic and has a substantially rectangular cross-section, and a cylindrical connecting part for filling, and may have at least one surface projecting from said container body. Said surface may be a portion of a cylindrical wall, also forming one of the walls of the container body. Alternatively, the said surface may be formed by a flat laminar zone projecting from the said container body. In a further alternative, the said surface is formed by a flat laminar zone developed as an extension of one of the walls of the said cavity parallel to the direction of the rays of an optical analysing system; said laminar zone may be developed symmetrically on opposite sides of the substantially prismatic cavity; the longitudinal edges of said laminar zone and an additional projection located at a distance from said edges may define a volume of the test tube contained and centred in a cylindrical housing; also the said projection may be longitudinally developed along the plane of symmetry perpendicular to said laminar zone.

According to other possible embodiments, the container body is cylindrical and has at least one surface projecting from said container body. Said surface may be formed by at least one flat laminar zone projecting from said cylindrical container body; said flat laminar zone may project tangentially from the cylindrical body or may project on opposite sides of the cylindrical body. The

test tube may also comprise two flat laminar zones which are essentially parallel and spaced from one another.

Yet another test tube may comprise a container which has a substantially prismatic shape with a rectangular cross-section, and a bar code may be applied onto at least one of the walls essentially parallel to the rays of the optical analysing system.

The invention also relates to an apparatus for analyses of the type for determining the sedimentation velocity of particles in organic liquids, comprising means for receiving a plurality of test tubes and comprising optical reading means mounted on a slide designed to travel along the test tubes which are housed inside the apparatus. For use of the tests tubes described above, such an apparatus is characterized in that it comprises on said slide also means for reading data, such as a bar code, located on the carrying surface of these test tubes. The said data reading means are advantageously positioned so as to perform reading in a direction parallel to the walls of the test tube passed through by the rays of the optical analysing system. Each of the seats designed to contain the test tubes has a longitudinal opening designed to allow reading - by the reading means - of a bar code applied onto one of the surfaces of the test tube.

In any case, the test tube according to the invention offers the possibility of using an ample flat surface for receiving bar codes and other data useful for the operations for which the test tube is used.

Brief Description of the Drawings

The invention will be more clearly understood with reference to the description and the accompanying drawing, which shows a practical non-limiting embodiment of the invention. In the drawing:

Figs. 1 and 2 show a front and a side view respectively of a test tube according to the invention,

partially sectioned;

Figs. 3 and 4 show a section and a view of the test tube on transverse planes indicated by III-III and IV-IV in Fig. 2, respectively;

Figs. 5 to 15 show - similarly to Fig. 3 - possible variants of the test tube.

Detailed Description of Preferred Embodiments

With reference to Figures 1 to 4, the test tube 1 comprises a container body with a cavity 3 which is substantially prismatic and has a substantially rectangular cross-section and with a cylindrical connecting part 5 for filling and closing by means of a stopper not shown in the drawing. The prismatic cavity 3 has, corresponding to the long sides of its cross-section, walls 3A, 3B (Figs. 1 and 3) which are flat and of more or less constant thickness, except for a slight variation of the internal dimension of cavity 3 for removal of the test tube from the manufacturing mould, the test tube being preferably formed using transparent plastic. These walls 3A, 3B are designed to be passed through perpendicularly, in the direction of the arrow F (Fig. 3), by the light rays of an electro-optical analysing system.

The test tube also comprises a flat laminar zone 7, developed as an extension of one of the walls of the said cavity 3 parallel to the direction F of the rays of the optical analysis system. This flat laminar zone 7 is capable of receiving information which can be read using reading means for example of the optical type, such as a bar code or the like. Advantageously the said laminar zone 7 extends symmetrically on opposite sides of the essentially prismatic cavity.

In a preferred embodiment, the longitudinal edges 7A, 7B of said laminar zone and an additional longitudinal projection 7C located at a distance from said edges define a volume of the test tube such as to be able to centre the

test tube itself inside a cylindrical housing. The said longitudinal projection 7C may be developed along a plane of symmetry perpendicular to said laminar zone 7. All this makes it possible to achieve effective centring of the test tube in the seats provided in the analysing equipment.

In any case the test tube offers the possibility of using an ample flat surface 7 for receiving bar codes and/or other data useful for the operations for which the test tube is used.

Figs. 5 to 15 show cross-sections of further possible embodiments of test tubes which have requirements equivalent to those of the test tube already described. These test tubes have at least one surface capable of receiving the information, such as the surface 7, and a volume contained within a circular profile (viewed in cross-section); moreover, the containing space of the body of the test tube may be analysed by a beam of rays which pass through it, being defined with flat or also curved walls, as far as a circular cross-section.

It is understood that the drawing shows only an example provided by way of a pratical demonstration of the invention, it being possible to vary the forms and arrangements thereof without thus departing from the scope of the idea underlying the invention itself. The presence of any reference numbers in the accompanying claims has the purpose of facilitating reading of the claims with reference to the description and to the drawing, and does not limit the scope of protection represented by the claims.

Claims

1. Test tube for biological analyses of organic liquids using electro-optical equipment in general, having a container body with a liquid-containing cavity defined by walls comprising zones located opposite one another and capable of being passed through by the rays of an optical analysing system, and a connecting part for filling, characterized in that it comprises moreover at least one surface, which is developed so as not to interfere with said zones located opposite one another and on which surface information which can be optically read, such as bar codes or the like, may be accommodated.

2. Test tube according to Claim 1, characterized in that said surface or surfaces and said container body have, in cross-section, a form contained in a circular volume.

3. Test tube according to Claim 1 or 2, in which the container body (1) has a cavity (3) which is essentially prismatic and has an essentially rectangular cross-section, and a cylindrical connecting part (5) for filling, characterized in that it has at least one surface projecting from said container body.

4. Test tube according to Claim 1 or 2 or 3, characterized in that said surface is a portion of a cylindrical wall, also forming one of the walls of the container body (Fig. 7).

5. Test tube according to Claim 1 or 2 or 3, characterized in that said surface is formed by a flat laminar zone projecting from the said container body.

6. Test tube according to Claim 1 or 2 or 3, characterized in that said surface is formed by a flat laminar zone (7) developed as an extension of one of the walls of the said cavity parallel to the direction (F) of the rays of an optical analysing system.

7. Test tube according to Claim 6, characterized in that said laminar zone (7) extends symmetrically on opposite sides of the essentially prismatic cavity (3).

8. Test tube according to Claims 6 or 7, characterized in that the longitudinal edges (7A, 7B) of said laminar zone and an additional projection (7C) located at a distance from said edges define a volume of the test tube contained and centred in a cylindrical housing.

9. Test tube according to Claim 8, characterized in that said projection (7C) is longitudinal and is developed along the plane of symmetry perpendicular to said laminar zone (7).

10. Test tube according to Claim 1 or 2 or 3, characterized in that the container body is cylindrical and has at least one surface projecting from said container body.

11. Test tube according to Claim 10, characterized in that said surface is formed by at least one flat laminar zone projecting from said cylindrical container body.

12. Test tube according to Claim 11, characterized in that said flat laminar zone projects tangentially from the cylindrical body.

13. Test tube according to Claim 12, characterized in that said flat laminar zone projects on opposite sides of the cylindrical body.

14. Test tube according to at least Claim 11, characterized in that it comprises two flat laminar zones which are essentially parallel and spaced from one another.

15. Test tube according to Claim 1, with a container body which has an essentially prismatic shape and a rectangular cross-section, characterized in that a bar code is applied onto at least one of the walls essentially parallel to the rays of the optical analysing system.

16. Apparatus for carrying out analyses of the type for determining the sedimentation velocity of particles in

organic liquids, comprising means for receiving a plurality of test tubes and comprising optical reading means mounted on a slide designed to travel along the test tubes which are housed inside the apparatus, characterized in that it comprises on said slide also means for reading data, such as a bar code, located on the carrying surface of these test tubes.

17. Apparatus according to Claim 16, characterized in that said data reading means are positioned so as to perform reading in a direction parallel to the walls of the test tube which are passed through by the rays of the optical analysing system.

18. Apparatus according to Claim 16 or 17, characterized in that each of the seats designed to contain the test tubes has a longitudinal opening designed to allow reading - by the reading means - of a bar code applied onto one of the surfaces of the test tube.

FIG. 1

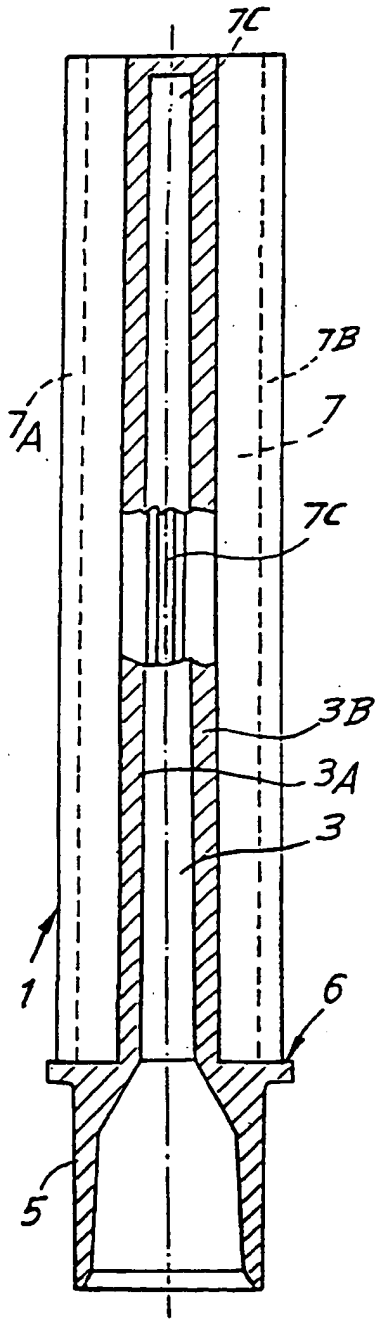


FIG. 2

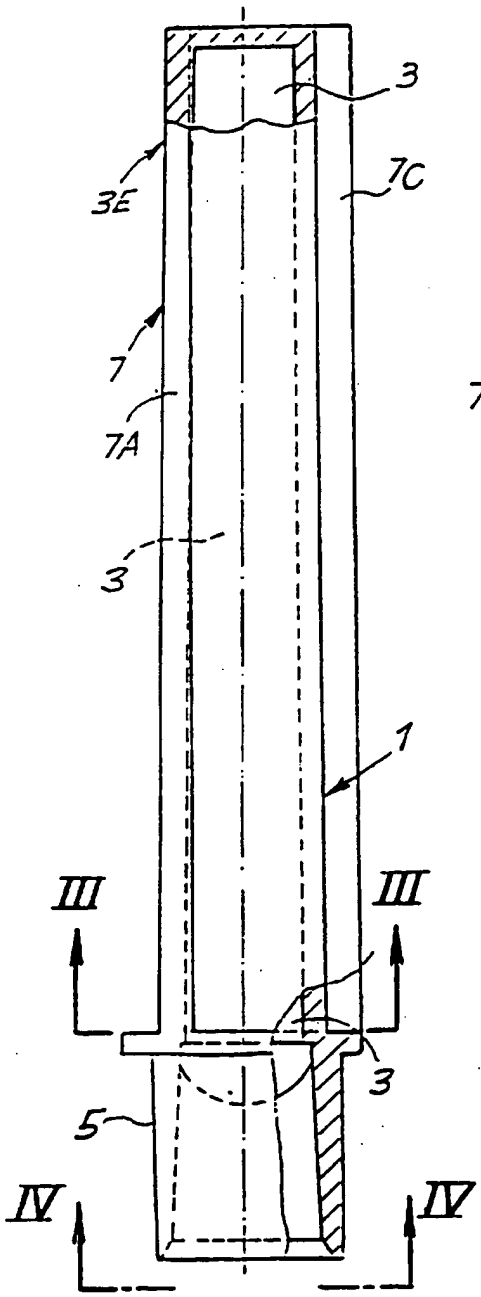


FIG. 3

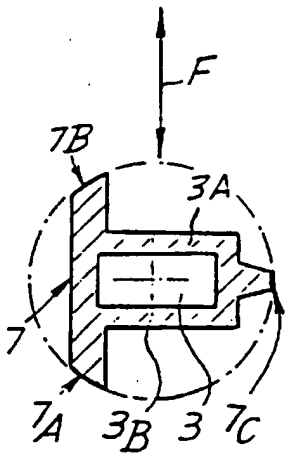


FIG. 4

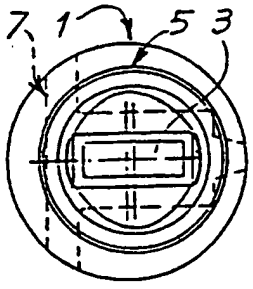
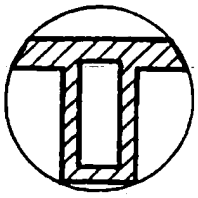


FIG. 5



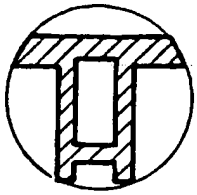


FIG. 6

FIG. 7

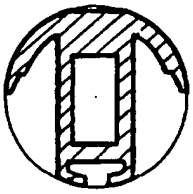


FIG. 8

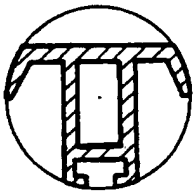


FIG. 9

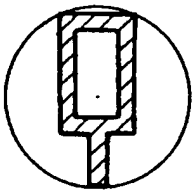


FIG. 10

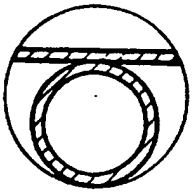


FIG. 11

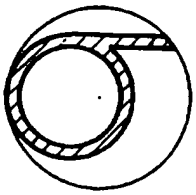


FIG. 12

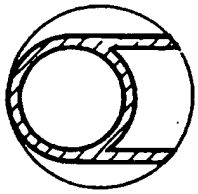


FIG. 13

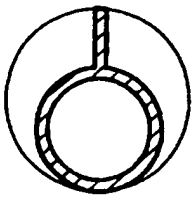


FIG. 14

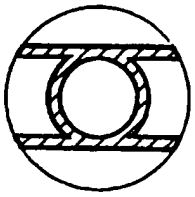
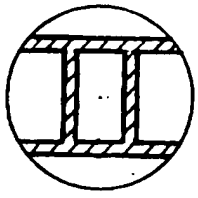


FIG. 15



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G01N21/03 B01L3/14

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 90 05903 A (MEDICAL LABORATORY AUTOMATION) 31 May 1990	1,2,5
A	see page 4, paragraph 12 - page 5, paragraph 2 see page 7, paragraph 2 see page 9, paragraph 2 - page 11, paragraph 1; figure 1	16
X	US 5 128 104 A (MURPHY HAROLD R ET AL) 7 July 1992 see column 4, line 45 - column 6, line 38; figure 1	1-3
X	EP 0 192 968 A (ALLIED CORP) 3 September 1986	1,2
A	see page 7 - page 8; figure 4	3,16

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[X] Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search	Date of mailing of the international search report
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

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